(Article: 34)

ZnO TRIPODS GROWN BY CATALYST FREE VAPOR-SOLID METHOD

S. Mandal[1*], A. Dhar[2], S. K. Ray[2]

[1]Department of Physics, Burdwan Raj College, Burdwan, 713104, India
[2]Department of Physics & Meteorology, IIT Kharagpur 721 302, India
*Corresponding author e-mail[1]: physur9@gamil.com

ABSTRACT

ZnO tripods have been grown on p-Si (100) substrates by using vapor-solid technique. By controlling the growth time and the substrate temperature, it is found that different nanostructures like ZnOnanorods, tripods, and tetrapods can be grown. The shapes of the nanostructures are very regular with the arm length varying from 2-3 µm and the diameter is of the order of 300 nm. Photoluminescence spectra of grown nanostructures exhibit band edge emission around 3.37 eV due to free excitonic emission and a broad emission band around 2.513 eV due to oxide related defect states.

Key words: ZnO; Nanostructures; Photoluminescence

INTRODUCTION

Semiconductor nanostructures have been synthesized with precisely controlled chemical composition, morphology, and size using various methods for potential applications in a variety of nanoscale devices. Because of the special geometry and strong confinement of electrons, holes and photons, nanostructures are attractive for potential use in fabricating nano-scale electronic and optoelectronic devices. As II–VI compound semiconductor with a wide band gap (3.3 eV), ZnO nanostructures are promising candidates for optoelectronics [1], field emission [2] and field effect transistors [3]. ZnO has the capability to crystallize into many configurations resulting in diverse growth morphologies such as nanocrystalline films, rods, wires, springs, combs, belts, helixes, prisms, tetrapods etc.[4-8]. The paper presents the growth of ZnO tripods on Si (100) using catalyst-free vapor-solid process. With the variation of time and temperature, a transition of growth from ZnOnanorods to tripods and finally to tetrapods is observed. The photoluminescence properties of ZnO tripods are discussed.